NOTES ON NEW ZEALAND PELECYPODS.

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The appearance of Suter's work on the Mollusca of New Zealand, in 1913 made a great advance in the study of the subject by making readily available descriptions, references to literature, figures, and other information on all the species admitted by him. The work forms a new starting-point for making known the constitution and relationships of molluscan fauna of New Zealand. Iredale, in an article published in vol. xlvii of the Transactions of the New Zealand Institute, next took up the subject from the point of view of nomenclature, made a number of changes in names, and proposed various new arrangements in the generic locations of the species. In the same volume I removed thirty-two names from the records of species from the Kermadec Islands in Suter's book. Other work on the recent species of New Zealand Mollusca since the appearance of Suter's Manual consists mainly in additions to the fauna made by E. A. Smith (Report, " Terra Nova " Expedition) and Miss M. K. Mestayer (Trans. New Zealand Inst., vols. xlviii, l, li).

A critical examination of types in the Dominion Museum and other material does not entirely confirm the results of either Suter or Iredale. Suter worked with plenty of New Zealand specimens, but appears not to have troubled to compare exotic species. Iredale, on the contrary, has ample foreign material to study, but, judging by his results, did not have sufficient New Zealand specimens, so that many of Suter's mistakes are repeated in Iredale's lists. The specimens available to me are not adequate either in New Zealand or exotic species, yet I have little doubt that many of the species of Pelecypods admitted by Suter and not here dealt with, will, when proper comparisons are made, share the fate of some of those I have examined. Unfortunately, Suter did not purge the New Zealand list of all the exotic species included by Hutton, and this result is especially misleading when new names founded on foreign material are included by Suter as good New Zealand species.

1. Anomia walteri, Hector.

The typical form of this species I have found only under stones near low-tide mark at the Bay of Islands, and on rocks between tide-marks in sheltered water at Port Fitzroy, Great Barrier Island, attached to a shell of *Mytilus canaliculus*. The shell is of regular shape, broader than high, with radiating ribs and the valves thin and almost transparent at the edges. This form is well figured by Suter (Man. N.Z. Moll., pl. lvii, fig. 10). Living on exposed rocks at the Bay of Islands, however, it becomes irregular in outline, the valves are much thicker, frequently the radial ribs are obscure or

obsolete, and the outer surface is dull and eroded. Such specimens are not easily separated from those of *A. trigonopsis*.

2. Anomia trigonopsis, Hutton.

Anomia trigonopsis, Hutton, 1877, Trans. N.Z. Inst., vol. ix, p. 598; Suter, 1915, N.Z. Geol. Surv. Pal. Bull., No. 3, p. 48.

Anomia huttoni, Suter, 1913, Man. N.Z. Moll., p. 843; Suter, 1914, N.Z. Geol. Surv. Pal. Bull., No. 2, p. 34.

Anomia undata (not Hutton), Suter, 1913, Man. N.Z. Moll., p. 843.

That there are two, but not more than two, recent species of Anomia in New Zealand is the conclusion I have arrived at after studying the material available. The type of *A. huttoni*, and the specimen on which Suter has admitted, *A. undata*, as a recent species (Man. N.Z. Moll., p. 843), are in the Dominion Museum. There is no difference by which they can be separated. Suter's figure of *A. undata* (pl. 57, fig. 9) is not the recent specimen, but, judging by the measurements, is that of the type, a Pliocene fossil. *A. undata* is a distinct species so far only found fossil in the Pliocene. I am unable to distinguish *A. trigonopsis* of Hutton, as represented by Suter's plesiotype in the collection of the Geological Survey, from the recent shells in the Dominion Museum. This being the earliest name, I apply it to all the recent examples of Anomia from New Zealand except *A. walteri*. As a species, *A. trigonopsis* may be defined as being irregular in form, with moderately thick valves with a pinkish sheen. The left valve has irregular, more or less concentric plications, striæ, and lamellæ, but no distinct radial ribs. The relative position of the muscular scars and the shape of the disc varies with the shape of the shell and affords no diagnostic characters. The lower byssal scar, however, is not relatively large, as in *A. undata*. The range of *A. trigonopsis* is from the Miocene to recent.

3. Monia furcata, Suter.

Anomia furcata, Suter, 1907, Trans. N.Z. Inst., vol. xxxix, p. 262, pl. 9, figs. 9, 10; Suter, 1913, Man. N.Z. Moll., p. 842, pl. li, figs. 6, 6*a*.

My attention was first drawn to the wrong classification of this species in Suter's Manual by Mr. Marwick, who suggested that by the sculpture it should be a *Monia*. We then examined the type and found the characters of that genus, namely, only two muscular scars, of which the byssal was radiately striated. The examination of further specimens confirmed this. Suter has figured three muscular scars and also described the characters of three, but only two exist. He further states (Trans. N.Z. Inst., vol. xxxix, p. 263, 1907) that of a number of left valves obtained only one showed the muscle scars distinctly. In this, apparently, he was also mistaken. The species is found commonly in Hauraki Gulf, at depths of about 25 fathoms, attached to the shells of *Pinna zelandica*. Specimens

reach a length of 28 mm., and have in the central and dorsal portion of the left valve a large green patch showing both inside and outside.

4. Mytilus planulatus, Lamarck.

Mytilus planulatus, Lamarck, 1819, Anim. s. Vert., vol. vi, pt. 1, p. 125.

Mytilus edulis (not Linné), Hutton, 1880, Man. N.Z. Moll., p. 167; Suter, 1913, Man. N.Z. Moll., p. 862, pl. lvi, fig. 4.

For more than forty years the common mussel of the southern portion of New Zealand has been masquerading under the name of *M. edulis* of the Arctic and north temperate regions. This is the more strange because the species to which it belongs was, on Australian specimens, recognized as distinct from the northern species by Lamarck over 100 years ago, and, judging by the synonyms, by several other authors subsequently. The type is from King George's Sound, Western Australia, and the species occurs from there eastward to New South Wales and Tasmania. In New Zealand it is the most common mussel found between tide-marks from Cook Strait southward, and it is also found at Great Barrier Island. The true *M. edulis* has an expanded lip, or hinge-plate, bearing a row of small teeth, usually four to six in number. The colour of the shell is bluish- to brownish-black, with radiating blue lines. These latter are best seen on young shells, but many old ones also show them. The New Zealand shell is much thicker and heavier, and has only two or three teeth, larger than in *M. edulis* and placed inside the apex, not on an expanded lip. The colour is bluish-black weathering to blue, and there are never any radiating bands. It is thus easily separated from *M. edulis*, but I have failed to find any character by which it can be distinguished from *M. planulatus*.

M. planulatus from Cook Strait southward forms extensive associations on rocks in the mid-tide belt. In size it appears to increase from north to south. For instance, the average length of the shell in Wellington Harbour is 65 mm., in Stewart Island shells of 75 mm. in length are common, while Suter states that specimens from the islands to the south of New Zealand are of a very large size. The largest specimens I have seen, however, came from Great Barrier Island, north of Auckland, and measured 89 mm. in length.

5. Modiolus confusus (Angas).

Perna confusa, Angas, 1871, Proc. Zool. Soc., p. 21, pl. i, fig. 21.

Modiolus fluviatilis, Hutton, 1878, Journ. de Conchyl., p. 53; Suter, 1913, Man. N.Z. Moll., p. 867, pl. clviii, fig. 6.

Modiolus confusus is an Australian species from which I am unable to distinguish *M. fluviatilis* of Hutton. In both countries the species occurs in brackish water, and is variable in the shape of the shells. Both Mr. May, of Tasmania, and Mr. Hedley, of Sydney, are in agreement with me in uniting the Australian and New Zealand forms under one name.

6. Ostrea angasi, Sowerby.

Ostrea angasi, Sowerby, 1871, Conch. Icon., vol. xviii, pl. xiii, fig. 27 ; Suter, 1913, Man. N.Z. Moll., p. 888, pl. lvii, fig. 3.

Ostrea reniformis (not Sowerby), Hutton, Journ. de Conchyl., vol. xxvi, p. 56 ; Hutton, 1880, Man. N.Z. Moll., p. 175.

Ostrea tatei (part), Suter, 1913, Man. N.Z. Moll., p. 889, pl. lvii, fig. 4 (the New Zealand shell only).

The characters of this species, so far as it is distinguished from other New Zealand species of *Ostrea*, are the irregular low distant radiating ribs and coarse laminations on the left valve, and the fine brown brittle laminæ on the right or flat valve. On muddy bottoms, where the shell is free or only slightly attached, the left valve is regularly convex. When a large portion of the left valve is attached to a rock it always turns more or less sharply up along the margin of the area of attachment. This is a necessary adaptation for the animal to get the space it requires between the two valves. It seems curious that the convex valve is the one that is attached to the rock and thus made subject to special adjustment, a circumstance that might have been avoided had the flat valve been the lower one. The species reaches its largest size in water of 15 to 20 fathoms in Foveaux Strait. Between tide-marks the shells are usually smaller, and being attached to rocks have the free portion of the lower valve turned at an angle to the attached portion. Shells only 2 or 3 cm. in diameter, at Spirits Bay on rocks between tides, I refer to this species.

The rock form of this species from the southern portion of New Zealand is classed by Suter with the Eocene fossil from Australia, which he then names *O. tatei* (Man. N.Z. Moll., p. 889, 1913).

7. Ostrea corrugata, Hutton.

Ostrea corrugata, Hutton, 1873, Cat. Tert. Moll. N.Z., p. 35 ; Suter, 1913, Man. N.Z. Moll., p. 890, pl. lvii, fig. 5.

Ostrea reniformis (not Sowerby), Suter, 1913, Man. N.Z. Moll., p. 892, pl. lvii, fig. 7.

There is a small oyster found on inter-tidal rocks in harbours and, in deeper waters, in Hauraki Gulf. I have examined specimens from Auckland, Wellington, Lyttelton, and Dunedin Harbours. It also occurs in Pliocene beds near Wanganui. It usually has a thin shell, with many often high, close, radiating ribs, three or four ribs to 1 cm., and is usually attached by only a small portion of the left valve. It is easily separated from *A. angasi* by these characters. The right valve often bears three broad, radiating, dark bands.

The type of Hutton's species, a Pliocene fossil, is in the Dominion Museum. The shell is more solid than recent forms and has larger, higher, and more distant ribs ; otherwise it agrees. Suter figures an oyster from Auckland Harbour under the name of *O. reniformis*,

Sowerby. Through the courtesy of Mr. Murdoch I have been able to examine this specimen, and it is referable to the present species. The use of the name *reniformis* shows how persistently names once introduced into the fauna are retained. Hutton used it for the Dunedin rock oyster (=*O. angasi*), but Sowerby's description does not agree with any New Zealand species. The locality from which it was collected is unknown, and the name is best rejected as indeterminable.

8. Arca trapezia, Deshayes.

Arca trapezia, Deshayes, 1840, Mag. Zool., p. 21.

This species has not hitherto been recorded from New Zealand, but in 1916 I found two waterworn valves at Spirits Bay, and a few years later Mr. A. W. B. Powell discovered a valve in a much better state of preservation at Muruwai, west of Auckland. All these specimens are large, heavy shells, but I am unable to separate them, as a species, from Australian specimens of *A. trapezia*.

9. Cardium maculosum, Wood.

Cardium maculosum, Wood, 1818, General Conchology, p. 218, pl. lii, fig. 3.

Protocardia pulchella (not Gray), Oliver, 1915, Trans. N.Z. Inst., vol. xlvii, p. 556.

I am indebted to Mr. Hedley for naming shells of this species and supplying the reference above quoted. It is found at the Kermadec Islands, whence I recorded it as *Protocardia pulchella*, which species, however, has not yet been obtained there.

10. Lasæa minutissima (Iredale).

Iredale (Trans. N.Z. Inst., vol. xl, 1908, p. 387) described this species as a *Modiolarca*. Suter (Man. N.Z. Moll., p. 926, 1913) reduced it to *Lascæa miliaris*. Iredale next asserts that his species is a "*Modiolarca*" and a valid species, and (Trans. N.Z. Inst., vol. xlvii, 1915, p. 487) lists it as *Gaimardia minutissima*. If, before making this statement, Iredale had examined specimens, he could not have repeated his error. The species is correctly placed by Suter under *Lascæa*, but it is certainly not *L. miliaris*. It is a good species, and should be entered as above.

11. Pseudarcopagia disculus, Deshayes.

With Iredale's statement that *Arcopagia* needs generic distinction I agree, but he incautiously accepts Suter's location of *Tellina disculus*, instead of examining the species for himself. It may be referred to *Pseudarcopagia*, which is a closer ally of *Tellina* than is *Arcopagia*.

12. Raeta canaliculata, Say.

Lutraria canaliculata, Say, 1822, Journ. Acad. Nat. Sci. Philad., vol. ii, p. 311.
Raeta perspicua, Hutton, 1873, Cat. Mar. Moll. N.Z., p. 65; Suter, 1913, Man. N.Z. Moll., p. 970, pl. lx, fig. 5.

This is a North Atlantic species, but a specimen in the Dominion Museum is the type of *R. perspicua*, Hutton. The original label bears no locality name, nor is any given with the original description. Yet Hutton afterwards (Man. N.Z. Moll., 141, 1880) attaches the locality "Bay of Islands", and forthwith the species "*R. inconspicua*" becomes safely installed in the New Zealand fauna. It should, of course, be omitted, and were this the only instance of foreign shells being introduced into the New Zealand lists by Hutton and retained by Suter it might be overlooked. But there are several others. Some may be detected, as when a known West Indian species like *Acanthoplema granulata* is included, but when foreign shells are made the types of new species, such "species" are likely to be long retained, especially by those who have not access to the types.

13. Antigona zelandica (Gray).

Dosina zelandica, Gray, 1835, Yate's New Zealand, p. 309; Gray, 1843, Dieffenbach's Travels in New Zealand, vol. ii, p. 249.
Venus zelandica (Gray); Hutton, 1873, Cat. Mar. Moll. N.Z., p. 70.
Venus oblonga (not Gray), Hanley, 1856, Cat. Recent Bivalve Shells, p. 359, pl. xvi, fig. 1 (possibly two species confused, but figure is that of *A. zelandica*).
Chione crebra, Hutton, 1873, Cat. Mar. Moll. N.Z., p. 70.
Cytherea crebra (Hutton), Suter, 1913, Man. N.Z. Moll., p. 984, pl. lxi, fig. 1.

A great deal of confusion exists with regard to the species included by Suter under *Cytherea*. Gray first described this common species under the name of *Dosina zelandica*. In 1843 Gray describes a second species (*D. oblonga*), and had no more names been applied to these two species all would have been well. Unfortunately, however, Hutton in 1873 described *Chione crebra*. The type of this is in the Dominion Museum, and is Gray's *A. zelandica*. Next, in 1880 (Man. N.Z. Moll., p. 147), Hutton reduces Gray's "*V. zealandica*" to the synonymy of *oblonga*, and keeps his own name *crebra* for the true *zelandica*. This course has been followed by Suter (Man. N.Z. Moll., 1913, p. 985). Iredale (1915), in restoring Gray's specific name, fails to note that Gray had correctly separated the two species, and, judging by his list on p. 494, retains *crebra* for Gray's *zelandica* and uses *zelandica* for Gray's *oblonga*.

14. Antigona oblonga (Gray).

Dosina oblonga, Gray, 1843, Dieffenbach's Travels in N.Z., vol. ii, p. 249.

Cytherea oblonga (Gray, not Hanley), Suter, 1913, Man. N.Z. Moll., p. 985, pl. lxi, fig. 2.

Antigona zelandica (not Gray), Iredale, 1915, Trans. N.Z. Inst., vol. xlvii, p. 495.

As a species, *A. oblonga* is doubtfully distinct from *A. zelandica*. It includes the oblong forms, which are not nearly so abundant as the more ovate forms. Many specimens are difficult to assign definitely to either species. The main characters relied on by Suter for distinguishing *oblonga* and *crebra* (= *zelandica*) are the shape of the lunule and the angle made by the dorsal and anterior sides. The lunule varies in shape with the width of the shell; the more ventricose the shell the wider the lunule. The angle made by the dorsal and anterior sides is more important, as the narrower it is the more prominent are the umbones. The brown colour markings are found on both species, and are best seen in young specimens.

Notopaphia elegans (Deshayes).

15. Notopaphia, n.gen.

Venerupis elegans, Deshayes, differs from true *Venerupis* and the allied genera, *Paphia*, *Protothaca*, and *Marcia*, in the characters of the teeth and in possessing a well-defined lunule. I therefore propose it as the type of a separate genus, *Notopaphia*.

The essential characters are: The anterior cardinals are directed forwards and parallel, or nearly so, to the margin of the shell; the lunule is deeply impressed; the sculpture consists of concentric laminæ and fine radial striæ, and the inner margins of the valves are crenulated. The right side of the lunule is larger than the left; in the escutcheon the reverse is the case. Pallial sinus, triangular.

16. Venerupis reflexa, Gray.

Venerupis reflexa, Gray, 1843, Dieffenbach's Travels in N.Z., vol. ii, p. 250; Suter, 1913, Man. N.Z. Moll., p. 998, pl. lxii, fig. 7.

Venerupis siliqua, Deshayes, 1854, Proc. Zool. Soc., 1853, p. 5, pl. xviii, fig. 1; Suter, 1913, Man. N.Z. Moll., p. 999, pl. lxii, fig. 8.

V. reflexa and *V. siliqua* have been generally recognized as distinct species, but I do not think a dividing line can be found. According to Suter, the difference between them concerns the escutcheon and the lamellæ. The anastomosing of the lamellæ may at once be dismissed as of no classificatory importance, as in specimens assigned to both forms the shell is more irregular in outline and the lamellæ are similarly irregular. The escutcheon also, when present is small and variable. Finally, one other difference is observed when comparing the descriptions given by Suter. The right posterior cardinal is stated to be "small" in *reflexa*, and "strong, grooved" in *siliqua*. I have never seen it other than grooved; in fact, this is a character of the genus. I have examined specimens from many parts of New Zealand, and find it impossible to separate them into two groups. I therefore propose to unite the nominal species *reflexa* and *siliqua* under the first published name.

17. Bassina disjecta (Perry).

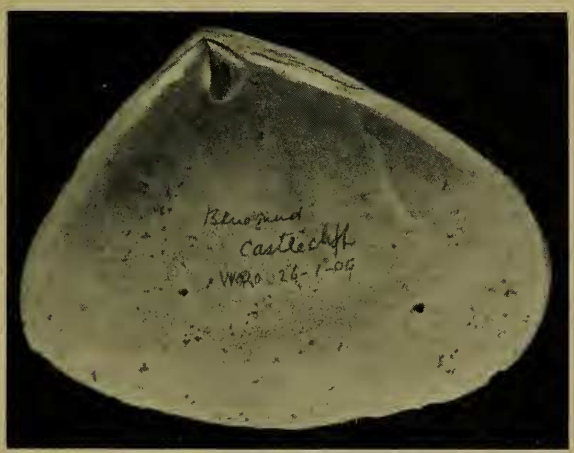
Venus disjecta, Perry, 1811, Conchology, pl. lviii, fig. 3.
Venus lamellata, Lamarck, 1818, Anim. s. Vert., vol. v, p. 592.
Chione lamellata (Lamarck), Hutton, 1873, Cat. Mar. Moll. N.Z., p. 69.
Chione disjecta (Perry), Suter, 1913, Man. N.Z. Moll., p. 989, pl. lxi, fig. 5.

This species has been admitted to the fauna of New Zealand on the evidence of two valves in the Dominion Museum. The original labels bear no locality name, nor is any given when Hutton includes the species in his Cat. Mar. Moll. of New Zealand. The species next appears in Hutton Man. N.Z. Moll, p. 147, 1880, with the locality Auckland, with Cheeseman as authority. Finally, Suter (1913) gives Cook Strait as the locality and omits Auckland. The history of this species is like that of *Raeta perspicua*, recorded above. In his Manual, Hutton appears to have set himself the task of attaching localities to the species he had previously included in his Catalogue without any. Suter not only follows him without question, but goes so far as to hunt up extra localities or change Hutton's. No good can come to science by such methods. The simple fact is that the Dominion Museum specimens have no authentic history. They, of course, I might without fear of contradiction say, certainly came from Australia, and the name should be struck off the list of New Zealand Mollusca.

18. Amphidesma subtriangulata, Wood.

This appears to be a variable species, the extreme forms of which are the thick, angled, triangular form from the north, and the flattened, more ovate, form from Banks Peninsula and other localities in the south. This last form is *quoyi*, which Iredale (Trans. N.Z. Inst., vol. xlvii, p. 492, 1915), says Suter has confused in the description of *ventricosa*. But this is not the case. Suter, probably

with a series greater than was available to Iredale, included *quoyi* in the description of *subtriangulata*. His reference of *M. lata* to its synonymy, and his labels on specimens in the Dominion Museum, prove this. That we are dealing with one variable species, and not two species, is shown by the fact that variations in those characters which are supposed to separate *quoyi* from *subtriangulata* may be observed in the same locality. For instance, in shells from the Chatham Islands the angle formed by the dorsal and posterior sides varies through several degrees, while shells from Takapuna vary in the thickness of the shell. While it is thus not practicable to separate a long series of shells from many localities into two species, yet those from the north-east coast between Spirits Bay and Tauranga are usually heavy ventricose shells with the posterior end short and, therefore, the angle made by the dorsal and posterior sides comparatively small. Shells from Kaipara and Gisborne southwards, and from the Chatham Islands, are almost invariably of the broad-angled, thin form. If it be convenient to refer to these differences *subtriangulata* and *quoyi* might be used sub-specifically, but in this case *quoyi* would not have the meaning intended by Iredale, but include besides the greater part, so far as area of distribution goes, of the species *subtriangulata*.



Amphidesma subtriangulata pliocenica, n.subsp.

Specimens from the Pliocene beds at Castlecliff are higher than either of the recent forms, and the angle of the dorsal and posterior sides is intermediate. It is more distinct from the two recent forms than they are from each other, and I here propose for it the sub-specific name *pliocenica*. Type in the Dominion Museum. Perhaps

it is from such an ancestor as this that the recent forms have descended. The early Pliocene *A. crassiformis* is a still deeper shell.

19. Dosinia maoriana, n.sp.

Dosinia cærulea (not Reeve), Suter, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 318; Suter, 1913, Man. N.Z. Moll., p. 977, pl. 60, fig. 8.

A shell rather rarely found in New Zealand is that hitherto recorded as *Dosinia cærulea*. The true *cærulea* is a Tasmanian and south-east Australian species, easily separated from the New Zealand shell by its much less prominent sculpture and less ventricose form. The New Zealand species appears to be a very distinct form, and as, so far as I am aware, it is not referable to any known species, I suggest the name *maoriana* for it. Type in the Dominion Museum.

D. cærulea is far more closely related to *D. lambata* than to *D. maoriana*.